JOINT ECDC-EFSA RAPID OUTBREAK ASSESSMENT

Multi-country outbreak of *Salmonella* Braenderup ST22, presumed to be linked to imported melons

20 July 2021

Abstract

Between 15 March and 6 July 2021, 348 confirmed *S.* Braenderup sequence type 22 (ST22) cases were reported in 12 European Union/European Economic Area (EU/EEA) countries and the United Kingdom (UK). The cases were spread throughout the countries and only two reported travel. A total of 68 cases were hospitalised. No deaths were reported.

The case interviews and an analytical epidemiological study suggested small melons (in particular Galia melons) as the possible vehicle of infection. *S.* Braenderup ST22 matching the outbreak strain was isolated in the UK in two imported Galia melons from one batch from Honduras, and in Austria from a pooled sample of melons (unknown origin) including Galia melons.

Based on epidemiological, microbiological and traceability investigations, the vehicles of infection are presumed to be melons imported from outside the EU/EEA and the UK. Galia melons from the batch imported from a Honduran producer are probable vehicles of infection, at least in those cases reporting having consumed Galia melons. Further investigation is needed to identify the point of contamination along the production chain.

The first cases in the EU/EEA and the UK were detected in March 2021, before the batch found to be contaminated had been harvested. This indicates that contaminated food vehicles had been circulating in these countries earlier. This is confirmed by the detection of the outbreak strain in melons in Austria in April 2021.

Control measures have been implemented for imported melons distributed on the EU market. The Honduran producer finished harvesting melons in April 2021. These melons are no longer on the market. No additional exports from Honduras are foreseen until the new season starts in December. These measures reduce the risk of new infections. Given delays in reporting and the possibility of secondary cases, further cases may still be reported, but with decreasing frequency.

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Also published in EFSA supporting publications: Technical report approved by EFSA on 16 July 2021; DOI: 10.2903/sp.efsa.2021.EN-6807; Key words: *Salmonella* Braenderup, melons, multi-country outbreak, whole genome sequencing (WGS). Requestor: European Commission; Question number: EFSA-Q-2021-00355; correspondence: roa-efsa@efsa.europa.eu, ISSN: 2397-8325

Event background

On 3 May 2021, **Denmark** reported a genomic cluster of *Salmonella* Braenderup sequence type 22 (ST22) infections in the ECDC Epidemic Intelligence Information System (EPIS) (UI-719). On the same day, Belgium reported an increase in *S.* Braenderup cases, including four isolates that had been sequenced and clustered genetically with the Danish outbreak strain.

The outbreak strain is *Salmonella* Braenderup ST22, CT8229 (cgMLST Enterobase scheme in SeqSphere). The strain belongs to the cgMLST HC5_ 259996 cluster (Enterobase scheme) [1]. The 5-SNP designation according to the Public Health England (PHE) pipeline is 1.1.39.57.631.725.% (t5:725) [2]. Based on the national tests for antimicrobial susceptibility, including predicted resistance from sequence data, the strain is fully susceptible.

Denmark has uploaded the representative outbreak strain in the European Nucleotide Archive (ENA) ERR5863130 and in Enterobase 2104T8198. A representative strain for the UK cases has been uploaded in ENA with the code SRR14247087.

Epidemiological and microbiological investigations of human cases

Outbreak case definition in the EU/EEA and the United Kingdom

The European outbreak case definition is as follows:

A confirmed outbreak case

- A laboratory-confirmed *Salmonella* Braenderup case with symptom onset on or after 15 March 2021 (date of sampling or date of receipt by the reference laboratory if date of onset is not available).

AND

- Fulfilling the laboratory criteria: with a *S.* Braenderup ST22 isolate clustering by
  - the national SNP pipeline within six SNPs, OR
  - the national cgMLST pipeline within five cg-allelic differences (AD) with the representative outbreak strain, accessible through the ENA code ERR5863130 and in Enterobase 2104T8198, OR
  - clustering in a centralised whole genome sequencing (WGS) analysis within five cg-allelic differences in a single linkage analysis, OR
  - belonging to the same cgMLST HC5_ 259996 cluster (Enterobase scheme), OR
  - belonging to a 5-SNP single linkage cluster with SNP designation 1.1.39.57.631.725.% (t5:725) according to the PHE pipeline in the United Kingdom (UK).

A possible outbreak case

- A laboratory-confirmed *Salmonella* Braenderup case with symptom onset on or after 15 March 2021 (date of sampling or date of receipt by the reference laboratory if date of onset is not available).

Epidemiological and microbiological investigations of human cases in the EU/EEA and the United Kingdom

As of 23 June 2021, **Denmark** had recorded 37 confirmed *S.* Braenderup ST22 cases in the cluster. The dates of sampling range from 26 March to 11 June 2021. Of 37 cases, 24 are female and 13 male. Age range is 1–90 years. The cases have occurred nationwide, and no history of travel has been reported.

As of 22 June 2021, **Austria** had reported seven confirmed *S.* Braenderup ST22 cases with 0-2 AD to the Danish outbreak strain and seven probable *S.* Braenderup outbreak cases. Five of the confirmed cases are female and two male. Age range is 4–91 years (median 49 years).

On 3 May 2021, **Belgium** reported a significant increase in *Salmonella* Braenderup cases. As of 23 June 2021, 46 confirmed and eight probable cases had been notified between 23 March and 24 June 2021, which is more than expected when compared to five annual cases in 2018 and 16 in 2020. Cases are spread across the country, but 34 of the 46 cases were isolated in Flanders (the north of Belgium). In terms of gender, 32 confirmed cases are female and 14 male. Age range is 0–97 years (median 35 years). All isolates from confirmed cases cluster by 0-4 AD with the Danish outbreak strain. Eleven confirmed cases reported no travel history, and travel history was unknown for 35 cases.

On 6 May 2021, the **Czech Republic** reported four cases with *S*. Braenderup infection. Three of these have been confirmed by WGS analysis as being part of the cluster (0-1 AD from the Danish outbreak strain). The cases occurred between 14 and 27 April 2021 (sampling dates). One case is a 30-year-old man and two cases, a one-year-old girl and a 30-year-old woman, belong to the same household. None of these cases reported travel history.

On 4 May 2021, **Finland** reported cases matching the outbreak strain. As of 2 June 2021, nine confirmed *S*. Braenderup ST22 cases had been reported between 13 April and 12 May 2021. Six cases are female and three male. The age ranges is 19–75 years (median 44 years). The cases are spread nationally and eight cases had no travel history. Travel history was unknown for one case.

On 4 May 2021, **France** reported the first case of *S*. Braenderup case belonging to the WGS cluster (HC5_259996). As of 24 June 2021, six cases had been confirmed, all part of the HC5_259996 -cluster, with sampling dates between 30 March and 30 May 2021. Four cases are female and two male. Age range is 3–63 years (median 37 years). Five cases had no travel history and travel history was unknown for one case.

On 4 May 2021, **Germany** reported a notable increase in *S*. Braenderup notifications. By 17 June 2021, 75 cases of S. Braenderup had been reported and, as of 5 July 2021, 46 of these had been confirmed by sequencing. The date of isolate receipt to the national reference centre ranges between 27 March and 29 May 2021 for the confirmed cases. Of 46 confirmed cases, 34 are female and 12 are male. The age range is 0–86 years (median 35 years). Twenty-three cases had no travel history and for 23 confirmed cases travel history was unknown.

On 5 May 2021, **Ireland** reported four *S*. Braenderup ST22 isolates (0-1 AD from the Danish outbreak strain by cgMLST) with sampling dates between 30 March and 23 April 2021. There are usually zero to seven S. Braenderup ST22 cases reported annually. By 28 June 2021, two new possible outbreak cases of *S*. Braenderup had been reported with sampling dates on 29 April and 11 May 2021. Of four confirmed cases, two are female and two male with an age range of 0–78 years (median 7 years).

On 21 May 2021, **Luxembourg** reported cases with *S*. Braenderup infection. As of 11 June 2021, three cases (AD=1) had been confirmed between 5 May and 4 June 2021 (sampling dates). One case is a five-year-old girl, the second is a 49-year-old woman, and the third case is a 56-year-old woman. One case reported travel history to Kosovo[1] prior to disease onset.

On 6 May 2021, **the Netherlands** reported an increase in *S*. Braenderup infections in 2021. As of 5 July 2021, 34 cases had been reported. The cases are spread all over the country. Age range is 0–95 years (median 66 years). Of 34 cases, 25 are female and nine male. WGS data show that they cluster by ≤2 AD with the Danish representative strain.

On 4 May 2021, **Norway** reported a cluster of four cases with *S*. Braenderup infection at a nursing home and one case from another geographical region of Norway, not associated with the nursing home. The sampling dates range from 13 to 29 April 2021. Four cases are female and one is male. The age range is 70–93 years (median 77 years). All isolates have been sequenced and they cluster by ≤ 2 AD with the Danish outbreak strain.

On 5 May 2021, **Sweden** reported a genetic cluster of cases with *S*. Braenderup ST22 infection. As of 23 June 2021, 46 cases had been confirmed with sampling dates between 14 April and 9 June 2021. In terms of gender, 38 cases are female and eight male. Cases are spread nationally, and the age range is 0–95 years (median 50 years). All cases cluster with the Danish outbreak strain (variation within the Swedish cluster is six SNPs).

On 5 May 2021, **the United Kingdom** reported an outbreak of *S*. Braenderup ST22 infections through the European Commission in the Early Warning and Response System (EWRS). As of 6 July 2021, 102 cases had been reported in England (n=90), Scotland (n=8), Wales (n=2), and Northern Ireland (n=2) with sampling dates ranging from 29 March to 17 June 2021. There is a preponderance of female cases (62%), and cases range in age from six months to 101 years (median age 58.5 years). All isolates fall within a 5-SNP single linkage cluster with SNP designation 1.1.39.57.631.725.% (t5:725) through the PHE pipeline. This cluster is closely related (within 5 AD) to the Danish representative strain on Enterobase. A representative strain for the UK cases has been uploaded in ENA with a code SRR14247087.

Descriptive epidemiology

As of 6 July 2021, 348 confirmed cases of *S*. Braenderup ST22 had been reported in 12 EU/EEA countries and the United Kingdom between 15 March and 6 July 2021 (Figure 1). The case reports peaked in April and May when 198 and 128 cases (covering 93.7% of cases) were reported respectively. Among 348 confirmed cases, the infection was 2.3 times more frequently reported in females than males (Table 1). This ratio is significantly higher than the respective ratio of 1.2 among 300 *S*. Braenderup cases reported to the European Surveillance System (TESSy) in 2019. The age ranges from below one year to 101 years (median 49 years) across countries. Three countries have reported outbreaks or cases in nursing homes: Belgium (n=10), the Netherlands (n=10, 3 confirmed), and Norway (n=4). Of 171 cases with known data, 39.8% were hospitalised (n=68). The data on travel history was available for 225 cases and 99.1% of these reported no travel before disease onset. Two cases reported travel; one Danish case had travelled to Sweden and one case from Luxembourg had travelled to Kosovo.

[1] This designation is without prejudice to positions on status, and is in line with UNSCR 1244 and the ICJ Opinion on the Kosovo Declaration of Independence.

No deaths have been reported. The first case was detected in Belgium with disease onset on 19 March 2021 and the most recent date for clinical samples was 9 June 2021 for a Danish and a Swedish case.

In addition to the cases in the EU/EEA and the UK, two cases have been reported in Canada, 18 in Switzerland, and four in the United States through the EPIS. The first Canadian case had disease onset before 15 March, thus before the first case was detected in the EU/EEA, and in the second case *S.* Braenderup was isolated on 8 April 2021.

Figure 1. Distribution of confirmed *S.* Braenderup ST22 outbreak cases (n=348) by country and week (sampling, isolate receipt to the laboratory, or notification) in 12 EU/EEA countries and the UK, since 15 March and as of 6 July 2021

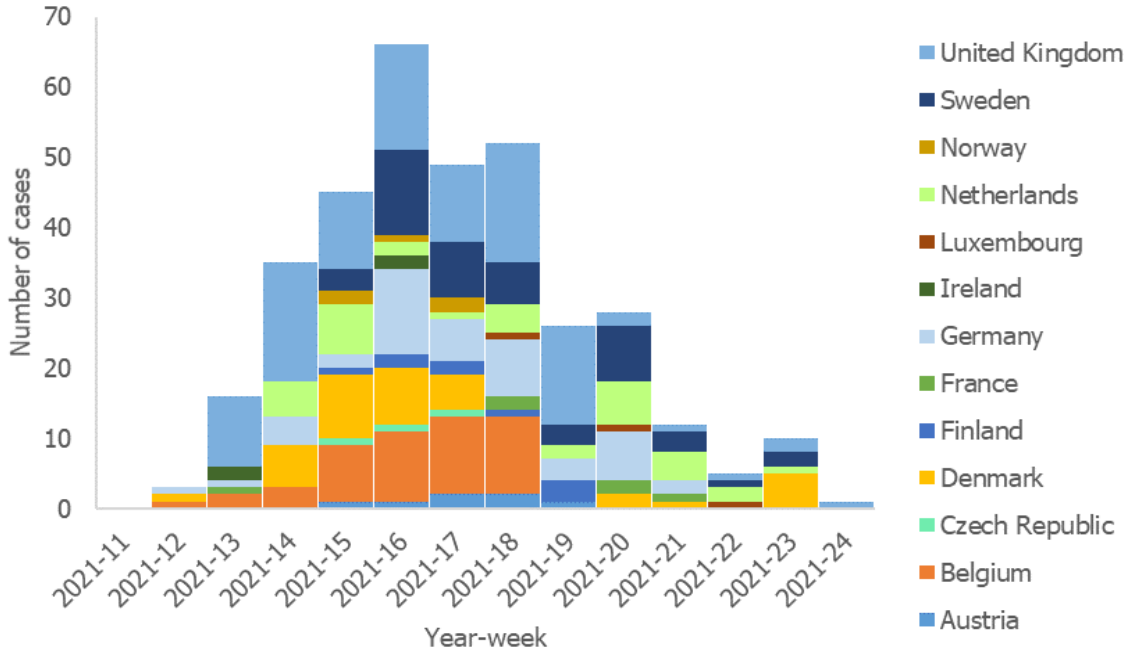


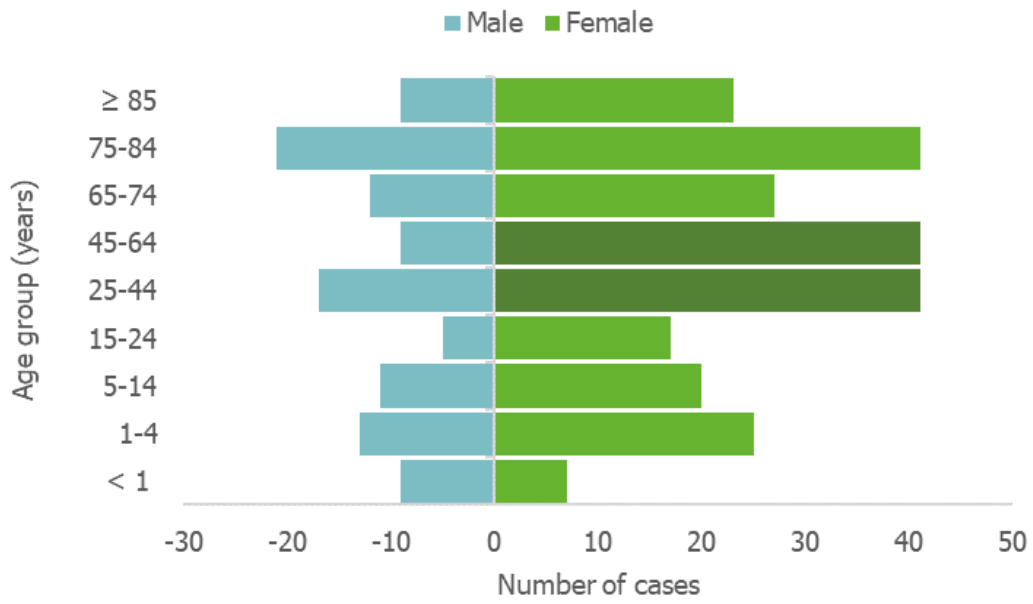
Table 1. Epidemiological and demographic characterisation of confirmed *S.* Braenderup ST22 cases in 12 EU/EEA countries and the UK, since 15 March and as of 6 July 2021

Country	No of confirmed cases	Reported dates in 2021	Female	Male	Age range years (median)	Travel	Comments
Denmark	37	26.3–11.6	24	13	1–90	No	
Austria	7	12.4–11.5	5	2	4–91	Unk	
Belgium	46	23.3–7.5	32	14	0–97 (35)	11 cases No 35 cases Unk	Eight confirmed cases in five nursing homes
Czech Republic	3	14.4–27.4	2	1	1–30	3 cases No	
Finland	9	13.4–12.5	6	3	19–75 (44)	8 cases No 1 case Unk	
France	6	30.3–30.5	4	2	3–63 (37)	5 cases No 1 case Unk	
Germany	46	27.3–29.5	34	12	0–86 (35)	23 cases No 23 cases Unk	Cases reported in 11/16 federal states
Ireland	4	30.3–23.4	2	2	0–78 (7)	2 cases No 2 cases Unk	
Luxembourg	3	5.5–4.6	3	0	5–56 (49)	1 case Yes 2 cases Unk	
Netherlands	34	8.4–13.6	25	9	0–95 (66)	27 cases No 7 cases Unk	A nursing home outbreak with 10 cases (three microbiologically confirmed)

Country	No of confirmed cases	Reported dates in 2021	Female	Male	Age range years (median)	Travel	Comments
Norway	5	13.4–29.4	4	1	70–93 (77)	No	A nursing home outbreak with four cases
Sweden	46	14.4–9.6	38	8	0–95 (50)	45 cases No 1 case Unk	
United Kingdom	102	29.3–17.6	63	39	0–101 (58.5)	65 cases No 37 cases Unk	
Total	**348**		**242**	**106**			

There is a predominance of females in all age groups except for infants under one year. The proportion of females was significantly higher than males (p<0.01) in two age groups ranging from 25 to 64 years (Figure 2).

Figure 2. Distribution of confirmed *S*. Braenderup ST22 outbreak cases (n=348) by gender and age groups, since 15 March and as of 6 July 2021



Note: The dark green bars representing female cases in the age groups 25-64 years show statistically significant difference when compared to males in the respective age groups (p<0.01).

Analytical epidemiology

Based on an analytical epidemiological (case-control) study in the UK, Galia melons rank highest with an Odds Ratio (OR) of 672 (p<0.001), followed by bananas with OR = 88 (p<0.05), followed by Cantaloupe melons with OR = 77 (p<0.001). This analysis was based on the data obtained from 31 case interviews with disease onset dates ranging from 30 March to 26 May 2021 and compared with data from 183 controls derived from a UK consumer market research panel (collected on 25–26 May 2021). Controls were frequency-matched for five age groups on the basis of total case numbers (71) at the time, using a stratification of 0–5, 6–17,18–44, 45–74, 75+ years of age. Of the cases included in the study, 51.6% (16 cases) had eaten Galia melons, 29% (nine cases) had eaten Cantaloupe melons, and 68% had eaten Galia and/or Cantaloupe. The multivariate model (Table 2) was constructed after checking for significant confounders and interactions. The table shows the OR for each exposure after adjusting for all other variables in the model. The results of a sensitivity analysis showed that the pattern of results observed was largely similar to the main analysis, with Galia melons still producing the highest odds ratio in both univariate and multivariate analysis.

Table 2. Multi-variate analysis of exposures to various fresh fruits and vegetables among *S.* Braenderup cases in the UK, as of 28 June 2021

Food item	Odds Ratio (OR)	95% confidence interval	p-value
Galia melons	672	[39 - 58975]	< 0.001
Cantaloupe	77	[6 - 1761]	< 0.001
Bananas	88	[5 - 4564]	0.01
Oranges	8	[2 - 63]	0.02
Leeks	17	[2 - 223]	0.02
Tomatoes	10	[2 - 110]	0.03
Chicken, fresh/frozen	7	[1 - 46]	0.03

Information from patient interviews

The consumption information was available for 197 confirmed *S.* Braenderup ST22 cases. A total of 63.3% of cases reported having consumed melons (any type) seven days prior to illness onset. Consumption of fresh watermelons was reported by 21.0% of 157 cases and fresh yellow melons by 50.4% of 115 cases (Table 3). Where melon type was specified, Galia melons were consumed by 45.7% of 140 cases, which was the highest proportion among the different melon types. When all melon types other than watermelons were grouped together, 62.2% of 172 cases reported having consumed at least one of these melon types, representing a significantly higher proportion of fresh melons (107/124, 86.3%) consumed by cases than watermelons (33/124, 26.6%) (p<0.001). The group "fresh yellow melons" was included to collect consumption data from cases that had consumed melons other than watermelons but could not recall the actual melon type.

Table 3. Reported consumption of melons by confirmed *S.* Braenderup ST22 outbreak cases (n=196) in 11 EU/EEA countries and the UK, since 15 March and as of 6 July 2021

Product	Consumed*				
Melons	Yes	%	No	%	Total
Fresh melons	124	63.3%	72	36.7%	196
Fresh watermelons	33	21.0%	124	79.0%	157
Fresh yellow melons	58	50.4%	57	49.6%	115
Cantaloupe	22	17.5%	104	82.5%	126
Honeydew + Canary melons**	34	23.9%	108	76.1%	142
Galia melons	64	45.7%	76	54.3%	140
Yellow melons, Cavaillon, Cantaloupe, Galia, Honeydew, and/or Canary melons	107	62.2%	65	37.8%	172
*Two cases with 'possibly yes' and one case with 'possibly no' have been categorised as 'Y' and 'N' respectively					
**Honeydew melons are also sold in Sweden as 'Canary melons'					

Four Norwegian cases live in a care home for people with dementia where melons are served regularly once a week. Galia melon was served to residents a few days before the first cases at the care home developed symptoms on 12 April 2021. Although consumption of Galia melon cannot be confirmed for these four cases, it is very likely that they ate it according to information provided by the care home staff. The fifth case confirmed consumption of Galia melon two days prior to illness onset.

In Belgium, some families reported consumption of melon but only one family member became ill. Ten cases (eight of which are confirmed) were reported from five nursing homes. Five of them were living in the same nursing home. One confirmed case lives in a shelter for disabled persons.

An outbreak of 10 cases occurred in a nursing home in the Netherlands. Of these cases, three were confirmed microbiologically as part of the multi-country outbreak cluster. Two additional unrelated cases ate brunch at the same hotel.

Microbiological and environmental investigations of food and control measures

Traceability analysis linked to food exposure information

This section summarises the results of the traceability investigations and the analytical results from samples directly or indirectly linked to melons reported to be related to the cases. These results were shared by countries under the RASFF information notification for attention 2021.2601 launched by the European Commission on 21 May 2021 (last accessed on 19 July 2021). A graphical representation of the traceability is available in Figure 3, Figures 4A and 4B and Annex 1.

United Kingdom

- Overall, two isolates of *Salmonella* Braenderup ST22 matching the outbreak strain were identified from Galia melons in Batch A, Barcode A and Batch A, Barcode B sampled at wholesaler level (British Wholesaler A) and originating from Honduras (Honduran Producer A).

The food safety authority in the United Kingdom reported to RASFF via the European Commission that, as a follow-up to epidemiological investigations, two official samples of the 200 Galia melons sampled tested positive for the representative outbreak strain. The *Salmonella* Braenderup ST22 isolates were sequence typed by Public Health England (PHE) as SNP address 1.1.39.57.631.725.931, matching at 0-SNP the majority of the British cases reported. They were sampled on 1 June 2021 at wholesaler level (British Wholesaler A) (*fup18*).

The two positive Galia melons (variety Amaregal) belonging to Batch A, Barcode A and Batch A, Barcode B originated from the Honduran Producer A and were imported into the United Kingdom by the British Wholesaler A by vessel (via British Transporter A) on 19 May 2021. The British Wholesaler A distributed these products to ten British food business operators (unknown) (*fup18*).

Finland

- Overall, one isolate of *Salmonella* Braenderup ST22 matching the outbreak strain was identified in a boot swab sample taken from a hobby henhouse.

The food safety authority in Finland reported the detection of the *S.* Braenderup outbreak strain to RASFF. The strain came from an environmental sample (boot swab) collected on 17 May 2021 from a hobby henhouse. The owner, who also tested positive for the *S.* Braenderup outbreak strain, fed the chickens with the melon rind. The traceability details of the watermelons, and possibly cantaloupe melons, reported to have been consumed by the owner were not available in RASFF.

In addition, the food safety authority reported that samples of melons were collected on 3 June 2021 from a grocery store (traceability not available in RASFF). In total, three samples of Galia melons from Honduras and two honeydew melons from Costa Rica were collected and they tested negative for *Salmonella* by PCR. The Galia melons also tested negative using the 'whole melon method' which includes the rind. Traceability details were not available (*fup28*).

Austria

- Overall, one isolate of *Salmonella* Braenderup ST22 matching the outbreak strain (2AD) was identified in a pooled sample (peel sample from Galia, Cantaloupe, and honeydew melons)

The food safety authority in Austria reported in RASFF that S*almonella* Braenderup ST22 matching the outbreak strain had been detected in a pooled sample of peels from Galia, Cantaloupe, and honeydew melons. The melons had been delivered on 13 April 2021 by the Dutch Distributor B (*fup33*). The food safety authority in Austria reported that there was no further information on the batch number or origin of the tested melons. The Dutch Distributor B distributed them to the Austrian Wholesaler B (31 May 2021) and the Austrian Wholesaler M (1 June 2021) (*fup20*).

Belgium

The traceback analysis performed by the food safety authority in Belgium was based on the food exposure information gathered from 14 Belgian cases that were interviewed (*fup5*, *fup11, fup 21, fup42*). The majority of the melons reported to have been consumed by the 14 cases were traced back, via different food operators, to a single common operator in Honduras (the Honduran Producer A).

More specifically, for two cases (one individual and an elderly resident of a nursing home) the Galia melons were traced back to the Dutch Wholesaler C that supplied the stores of Belgian Retail Chain A (19 to 24 April 2021) (*fup11, fup21, fup42*).

For five cases (elderly residents of a nursing home) the Charentais melons were traced back to the Dutch Wholesaler C that supplied different food operators in March–April 2021. In particular, the Dutch Company A distributed the melons to the Belgian Company B which in turn distributed them to the Belgian Company C. This company then distributed them to the Belgian Company D that in turn distributed them to the Belgian Company E. The Belgian Company E delivered fruit baskets to the nursing home. Further information on the type of fruit within the baskets was not available. For the same

five cases (elderly residents of a nursing home) and for one additional Belgian case, a specific batch of Galia melons (Batch B) and another batch of Galia melons (batch not available) were traced back to the Dutch Wholesaler D that supplied the Dutch Wholesaler E in April 2021. The Dutch Wholesaler E distributed the melons to the German Wholesaler F (on 3 April 2021) and to the Belgian Company F (on 2 April 2021) that made two deliveries of Galia melons (Batch B) (on 5 April 2021) and (batch numbers not available) (on 8, 11, 13, 15, 20, and 22 April 2021) to the Belgian Company G. The Belgian Company G delivered the Galia melons to the central kitchen of the nursing home. These melons were served as dessert to the residents which included the five cases.

For two children (at a childcare institution) the Galia melons were traced back to the Dutch Wholesaler D that supplied the Belgian Wholesaler G (on 3, 5, 7, 10 May 2021) (*fup42*).
For two cases (elderly residents of a nursing home) the Galia melons were traced back to the Belgian Wholesaler G that received the melons originating from Honduras via the Dutch Wholesaler D (30−31 March 2021, 9 April 2021) and melons originating from Costa Rica from the German Wholesaler K (7 April 2021).

For one case (seven-month child) the Cavaillon/Charentais melons were traced back to the Belgian Wholesaler H that distributed the melons to the Belgian Company H (on 2, 12, and 22 April 2021). The Belgian Company H distributed them to the Belgian Company I (on 2, 19, 23 April 2021) and the melons then eventually reached the Belgian Company J (on 14 and 23 April 2021). In addition, the Belgian Company H distributed the Galia melons (on 27 May 2021) to the Belgian Company AM. The traced-back Galia melons were eventually consumed by an additional case (one child at a childcare institution) on 3 June 2021 (*fup42*). The food authority in Belgium reported that the Belgian Wholesaler H received the last delivery from the Honduran Producer A Site 2 on 11 May 2021 (*fup42*).

The food safety authority in Belgium reported the outcome of the melon sampling (sampling places and dates not available) and the traceability investigations linked to the food exposure information in RASFF. As of 5 July 2021, the microbiological analysis from the sampling performed did not show non-compliance (*fup5, fup42*).

Netherlands

The food safety authority in the Netherlands announced in RASFF that food investigations based on the available RASFF information and the food exposure information (purchasing locations) from the Dutch confirmed cases were ongoing (4 June 2021) (*fup8*). Food handling procedures were also explored at the major importers and distributors for possible cross contamination events (*fup20*). The investigation revealed that, upon receipt, the boxes containing the melons were placed on tables for manual sorting (unsuitable melons are removed from the boxes) before distribution. Melons are not subjected to contact with food surfaces. The distribution of Galia melons from Honduras (namely the Honduran Producer A) and from Brazil (namely the Brazilian Producer D) (with most recent importation date from Honduras recorded as 23 May 2021) to food business operators in Europe via the Dutch Wholesaler D was mapped out in an extensive trace-forward exercise performed by the food safety authority. The Galia melons were delivered to Austria, Belgium, Bulgaria, Czechia, Denmark, Estonia, France, Finland, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Romania, Slovakia, Spain, Sweden, Switzerland, and the United Kingdom including Northern Ireland (*fup20*).

The food safety authority in the Netherlands reported in RASFF that the Dutch Distributor B distributed Galia melons imported from the Honduran Producer A to the Irish Distributor C on 22 and 25 March 2021 (*fup43*). The Dutch Distributor B had purchased Galia melons from the Honduran Producer A with delivery dates 15 and 19 March 2021. In addition, the Dutch Distributor B also delivered melons to Austria, Belgium, the Faeroe Islands, Germany, Greece, Sweden, and Switzerland (*fup43*).

On 11 June 2021, the food safety authority in the Netherlands announced the implementation of control measures consisting of the withdrawal and recall of Galia melons originating from Honduras. However, no public warning was issued since the products were presumably no longer on the market.

Ireland

The food safety authority in Ireland reported in RASFF that, based on retail loyalty card information, the Galia melon eaten by one of the four known cases was purchased at the stores of the Irish Retail Chain C on 26 March 2021. The Galia melon was supplied by the Dutch Distributor B to the Irish Distributor C on 22 and 25 March 2021 (*fup1, fup38, fup43*). The honeydew melon reported to have been consumed by two cases of the same Irish family was bought at the Irish Retail Chain D. It originated from Honduras and was supplied by the Italian Wholesaler I (*fup9*) that only acted as an intermediary trading company (*fup12*). The Irish Retail Chain D sourced melons from Brazil, Honduras, and Costa Rica (*fup7*). In addition, the food safety authority in Ireland informed that some Cantaloupe melons on the Irish market (at the time of the RASFF follow-up notification, 3 June 2021) originated from Honduras. Some voluntary withdrawals of melons from Honduras were implemented in Ireland at the end of May and early June 2021. Further traceability information (e.g. batch numbers) of these melons was not available in RASFF *(fup7)*. Furthermore, the food authority in Ireland reported that some of these Cantaloupe melons originating from the Honduran Producer A were tested and all of them were negative for *Salmonella*.

Italy

Following the traceback investigation performed by Ireland, the food safety authority in Italy performed an inspection at Italian Wholesaler I that worked as an intermediary trading company for the Irish Retail Chain D. In particular, the food safety authority in Italy reported in RASFF that in April 2021 (10-24 April 2021) the Italian Wholesaler I traded honeydew

melons between the Honduran Producer A and the stores of Irish Retail Chain D. However, the Italian Wholesaler I clarified that it had not specifically stocked the goods involved in the traceability of Irish Retail Chain D (*fup12*).

Luxembourg

The traceback details of the Galia melon consumed by one of the cases in Luxembourg were not available. However, the food safety authority in Luxembourg reported in RASFF that 36 samples of melons had been collected in June 2021 (4, 7, and 14 June 2021) 78 of which were analysed. The sampled melons were of different species and from various brands, producers/suppliers including the Honduran Producer A, with different origins (Honduras, Spain, Italy, Morocco, and France). All of them tested negative for *Salmonella* (*fup15, fup39*). Sampling details are provided in Table A2, Annex 1. In addition, on 2 July 2021, the food safety authority reported that the current market in Luxembourg mainly (if not totally) offered melons of European origin *(fup39*).

Norway

The food safety authority in Norway reported in RASFF that the melons served on 10 April 2021 at the Norwegian nursing home, where cases were registered, were possibly of different types, namely Piel De Sapo and honeydew melons received on 26 March 2021, and Piel De Sapo and Galia melons received on 9 April 2021. The melons had been delivered to the nursing home by the Norwegian Wholesaler J (*fup2*). The melons (Galia melons) served at the Norwegian restaurant where cases were also recorded were regularly provided by the Norwegian Wholesaler J. The Norwegian restaurant occasionally also purchased melons in a grocery shop near the restaurant. The Norwegian restaurant used the melons bought from the Norwegian Wholesaler J on 23 April 2021 and/or at the Norwegian grocery shop as ingredients in sandwiches served on 23 April 2021 (*fup2*).

The Galia melons (different consignments) served at the Norwegian nursing home and the Norwegian restaurant originated from different suppliers and sub-suppliers in Honduras, Costa Rica, and Brazil. The Piel De Sapo and the honeydew melons (different consignments) delivered to the Norwegian nursing home originated from different suppliers and sub-suppliers in Costa Rica (*fup2*). Further traceability details are available in Table A1, Annex 1.

Sweden

The food safety authority in Sweden reported in RASFF (on 1 June 2021) that four of the interviewed cases provided information on the stores of the Swedish Retail Chain B (unknown) (info not available in RASFF) where they had bought the melons consumed. The traceback investigations identified the origin of the Galia melons (Brazil and Honduras) and of the honeydew melons (Brazil and Costa Rica). Further traceability details were not available in RASFF (*fup3*).

Germany

The food safety authority in Germany reported in RASFF (on 1 June 2021 and 5 July 2021) that 26 melons were sampled at wholesale and retail level and tested in at least two of Germany's federal states. *Salmonella* was not isolated in any of the 26 samples collected (eight Galia melons, and eight Cantaloupe melons, nine honeydew melons, and one Piel de Sapo melon) originating from South and Central America. The inner part and the rind of the melons sampled were analysed separately in two aliquots. Further traceability details of the sampled melons were not available in RASFF (*fup4, fup41*).

In addition, the food safety authority reported that the German Wholesaler K delivered Galia melons from Costa Rica (supplied by the Company K) to the Belgian Wholesaler G on 7 April 2021 (*fup26*).

Denmark

Following the food exposure information from the Danish cases, the food safety authority in Denmark started investigating the available traceback information in early May. They reported that the majority of the food business operators imported the melons between March and May 2021 from different parts of South and North America, including Brazil, Honduras, Costa Rica and Morocco, and in June 2021 from Europe, mostly Spain. Specific details on batches or consignments were not available (*fup14, fup46*).

Spain

The food safety authority in Spain sampled melons of different varieties from the production area in Andalusia. Overall, 30 samples were taken (18 samples of Piel de Sapo melon, four samples of yellow melon, three samples of Cantaloupe melon and five samples of Galia melon) at fruit and vegetable producers' premises and at retail level. All the samples tested negative for *Salmonella*.

Czechia

The food safety authority in Czechia performed a traceability investigation for two food business operators and verified that the Czech Company AK did not purchase melons from Honduras via the Dutch Wholesaler D. Secondly, the food safety authority verified that the Czech Company AL had not imported Galia melons from Honduras or from Brazil via the Dutch Wholesaler D since the beginning of May 2021 as melons are imported from Spain throughout the summer period.

Following the reporting of the national cases, seven samples of melons were collected in June 2021 by the food safety authority in Czechia. These consisted of two samples of Cantaloupe melon, one Piel de Sapo melon, one

Amarillo-Honig melon, and three yellow melons. The sampled melons originated from Spain (six samples) and Costa Rica (one sample). All samples tested negative for *Salmonella*. Further traceability information on batches and consignments was not available (*fup37*).

Romania

The food safety authority in Romania reported in RASFF that Batch A was already sold and no longer in stock, therefore a withdrawal could not be implemented by the two operators (Romanian Company AI and Romanian Company AJ) that had received the melons from the Dutch Wholesaler D (*fup32*).

Bulgaria

The food safety authority in Bulgaria reported in RASFF that the Bulgarian Company AU had received melons from both Honduras (one delivery via the Dutch Company AV) and Brazil (two deliveries via the Dutch Company AW) in March and April 2021. There was no distribution outside Bulgaria.

Switzerland

Food investigations performed by the food safety authority in Switzerland following the food exposure interviews for a cluster of three patients could not confirm that the melons were contaminated with *Salmonella*. The samples all tested negative. However, no melons from Honduras were analysed (*fup40*).

In addition, the food safety authority reported that the five food business operators in Switzerland that received melons from the Dutch Wholesaler D (*fup20*) confirmed that there were no more Galia melons from South America on the Swiss market as of 18 June 2021. The latest import date was 7 May 2021. Melons from South America have been replaced - for seasonal reasons - by those of European origin. Nevertheless, the food safety authority requested that some of these melons be sampled and three samples were collected from Spain. *Salmonella* was not detected in any of the samples (*fup40*).

Honduras

The food safety authority in Honduras reported to RASFF via the European Commission and via the International Food Safety Authorities (INFOSAN) network that the Galia melons from Honduras were sent to the EU directly via the Netherlands and subsequently redistributed to Member States. The Galia melons were not exported to Canada, Brazil, or Costa Rica (*fup30*).

The Galia melons from the Honduran Producer A are harvested at two different sites, namely Site 1 (one farm, one packing plant) and Site 2 (two farms, one packing plant). During the 2020−2021 season (December 2020 to April 2021), Galia melons harvested at both sites and totalling 19 982 991 kg were exported to four different destinations: European Union (59%), United Kingdom (26%), United States (12%), and Japan (3%) (*fup30*).

In particular, the Galia melons from Batch A were sent to two distributors in the Netherlands, namely Dutch Distributor A and Dutch Distributor B (*fup30*).

A trace back analysis on Galia melons from Batch A was carried out by the food safety authority in Honduras. Batch A was harvested and packed on 21 April 2021 at Site 1 of the Honduran Producer A. A total of 12% (10 868 kg) of the batch was distributed to the European Union, 60% (56 636 kg) was exported to the United Kingdom, and the remaining 28% (26 736 kg) to the United States of America (*fup30*).

On 11 June 2021, the Honduran Producer A warned its customers in the European Union and the United Kingdom to perform a recall of Galia melons from Batch A still present on the market. Batch A was imported into the United States on 6 May 2021, but it was not delivered to Japan (*fup30*).

In addition, the food safety authority in Honduras reported that the harvest and packaging had been finalised on 26 April 2021 and that no additional exports from Honduras were foreseen before the beginning of the new season in December 2021. During the 2021 season, an overall amount of 4 000 samples were collected at different points of the production and packing chain (irrigation water, contact surfaces, process water, staff, finished product, etc.). No positive results were reported for any of the pathogens routinely monitored (*E. coli* O157:H7, *Salmonella* spp., *Listeria monocytogenes*). *Salmonella* including the serovar Braenderup was not identified, either in the production or the human sector (*fup30*). Trace forward analysis of melons produced in Honduras and intended for delivery to the United Kingdom is available in Table A3 of Annex 1 (*fup30*).

Moreover, the food safety authority reported via the European Commission that Cantaloupe melons are not produced and packed at the same facilities of Honduran Producer A as where the Galia melons from Batch A were harvested and packed (*fup34*). Specifically, the Cantaloupe melons (variety Italian Cantaloupe Fonseca) that were exported to Belgium were harvested and packed at Site 4 of the Honduran Producer A. The production of Galia and Cantaloupe melons is completely separate at Honduran Producer A and there are no links between the two production lines in terms of water sourcing, farms, harvest, packing, personnel, storage, shipping, etc. (*fup34, fup45*).

Figure 3. Graphical representation of the traceability of melons testing positive for the *S.* Braenderup outbreak strain, as reported by the countries involved under RASFF notification 2021.2601

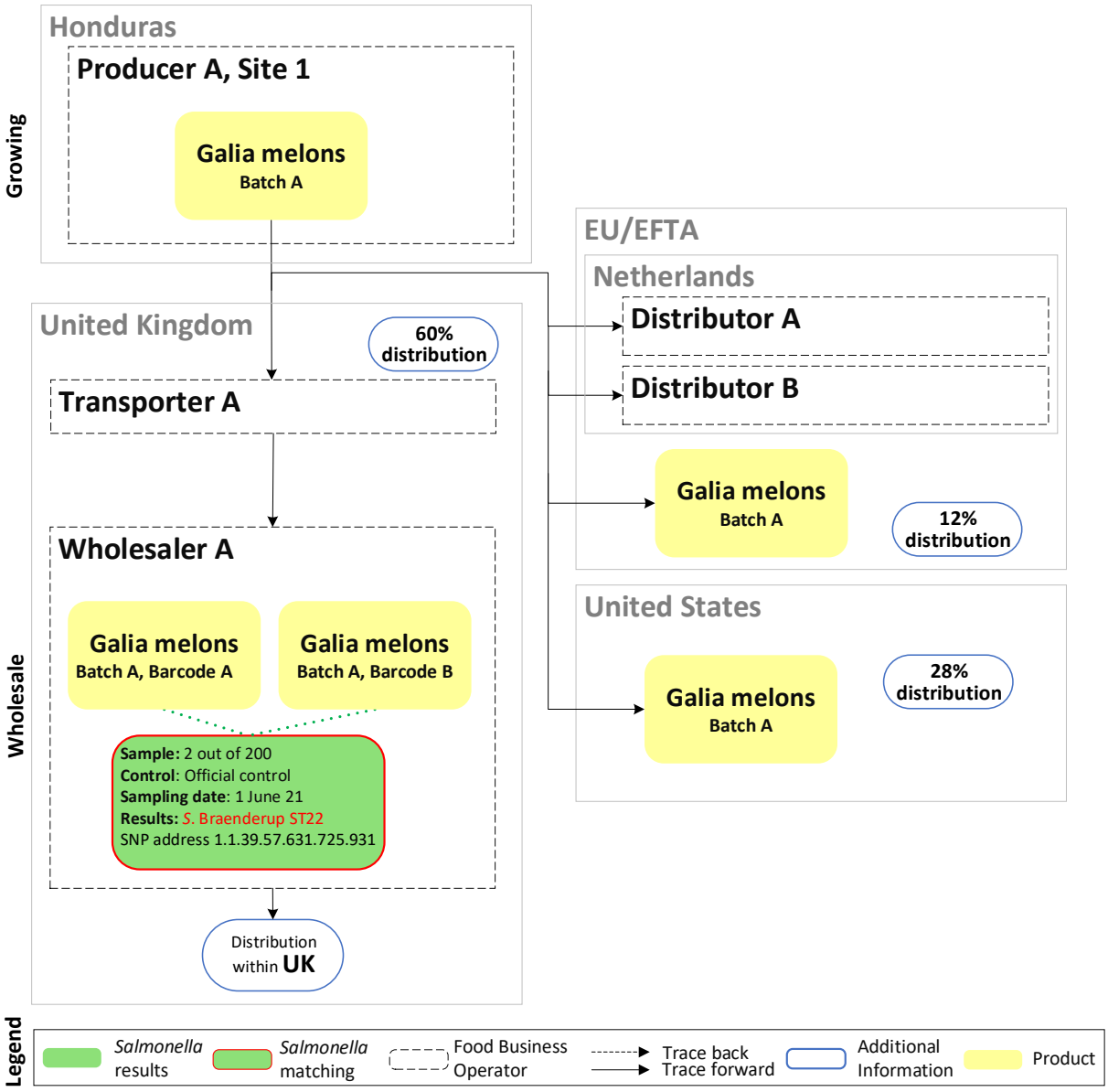


Figure 4A. Graphical representation of the traceability of melons from Honduras linked to the food exposure information, as reported by the countries involved under RASFF notification 2021.2601

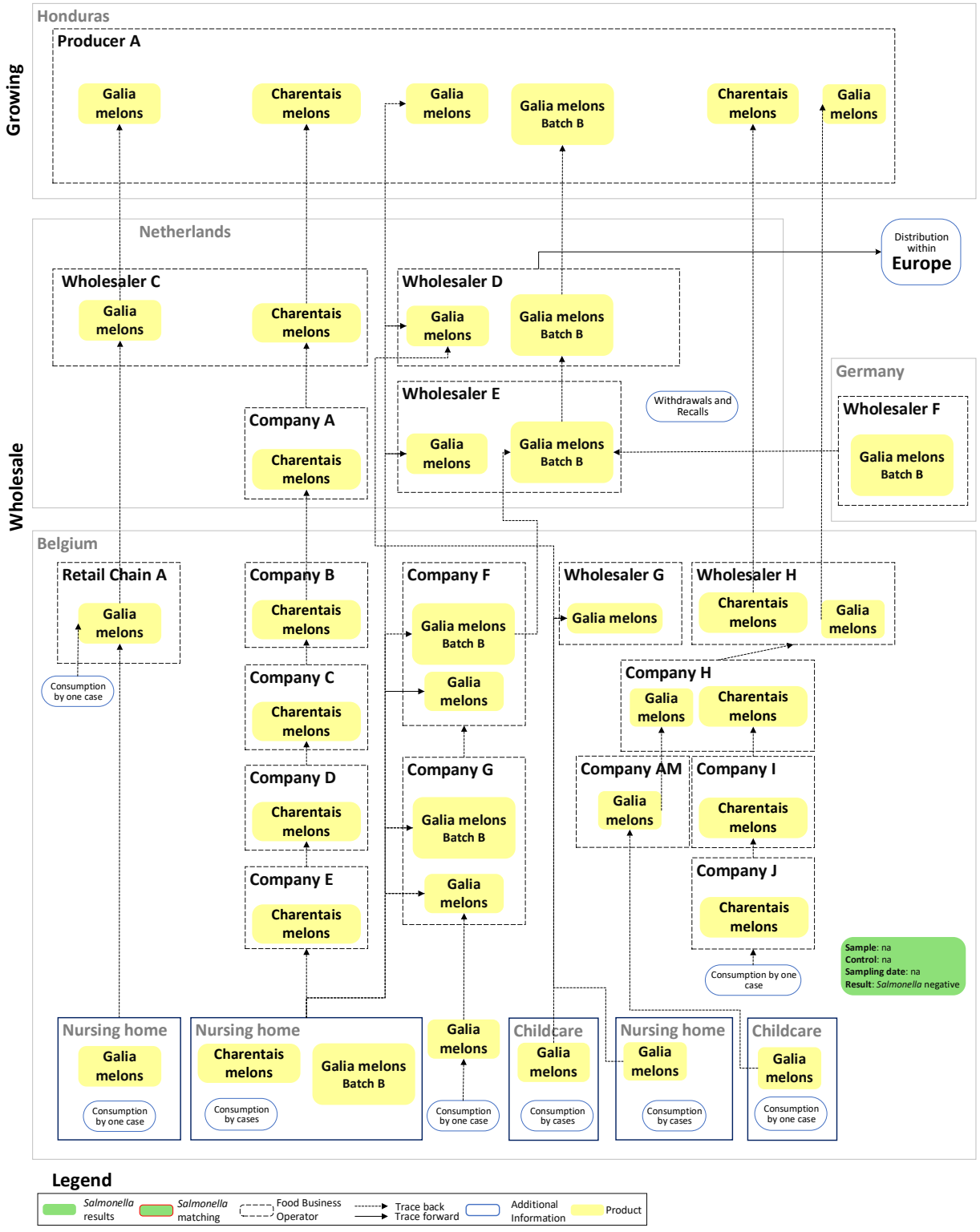
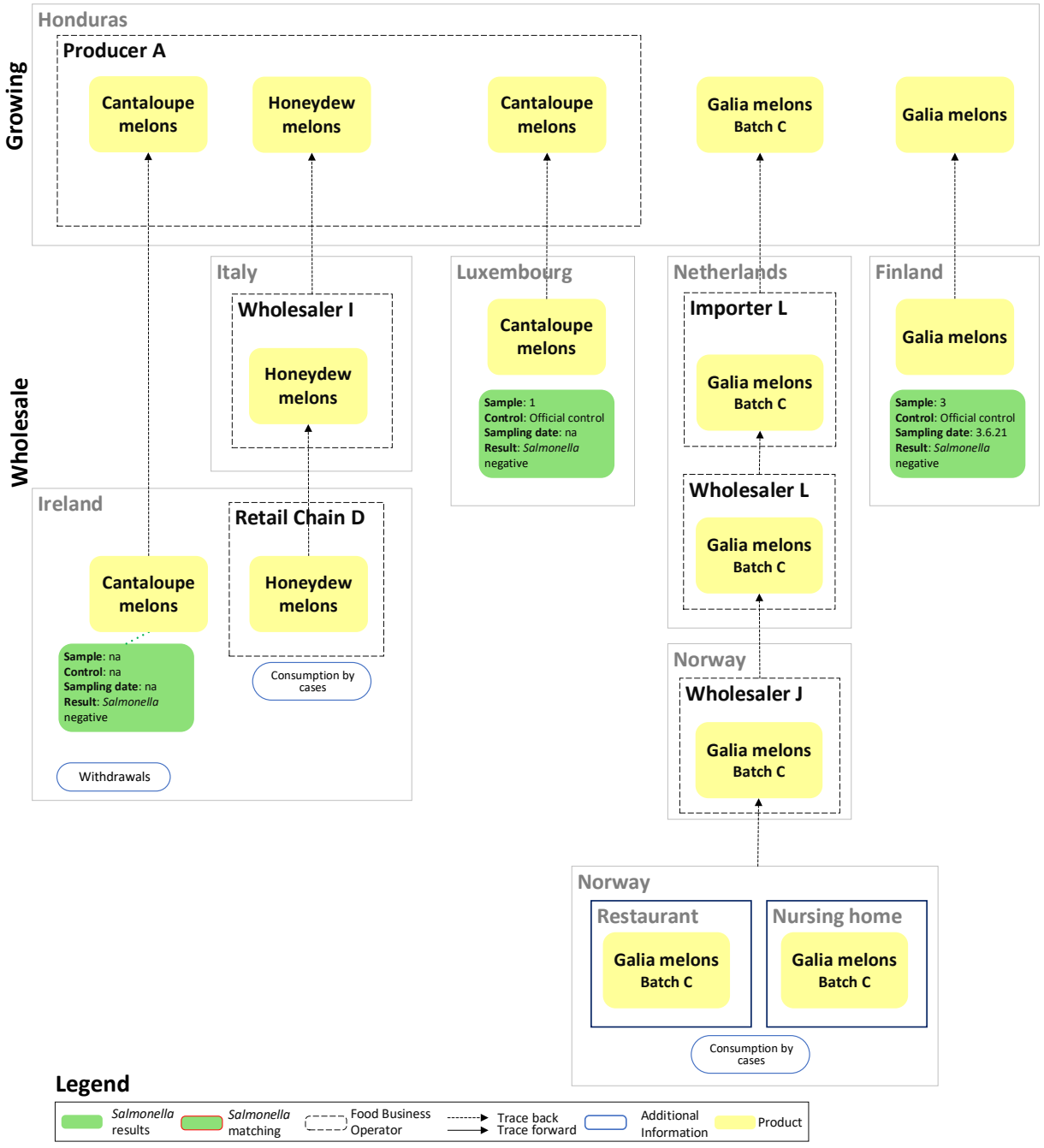


Figure 4B. Graphical representation of the traceability of melons from Honduras linked to the food exposure information, as reported by the countries involved under RASFF notification 2021.2601



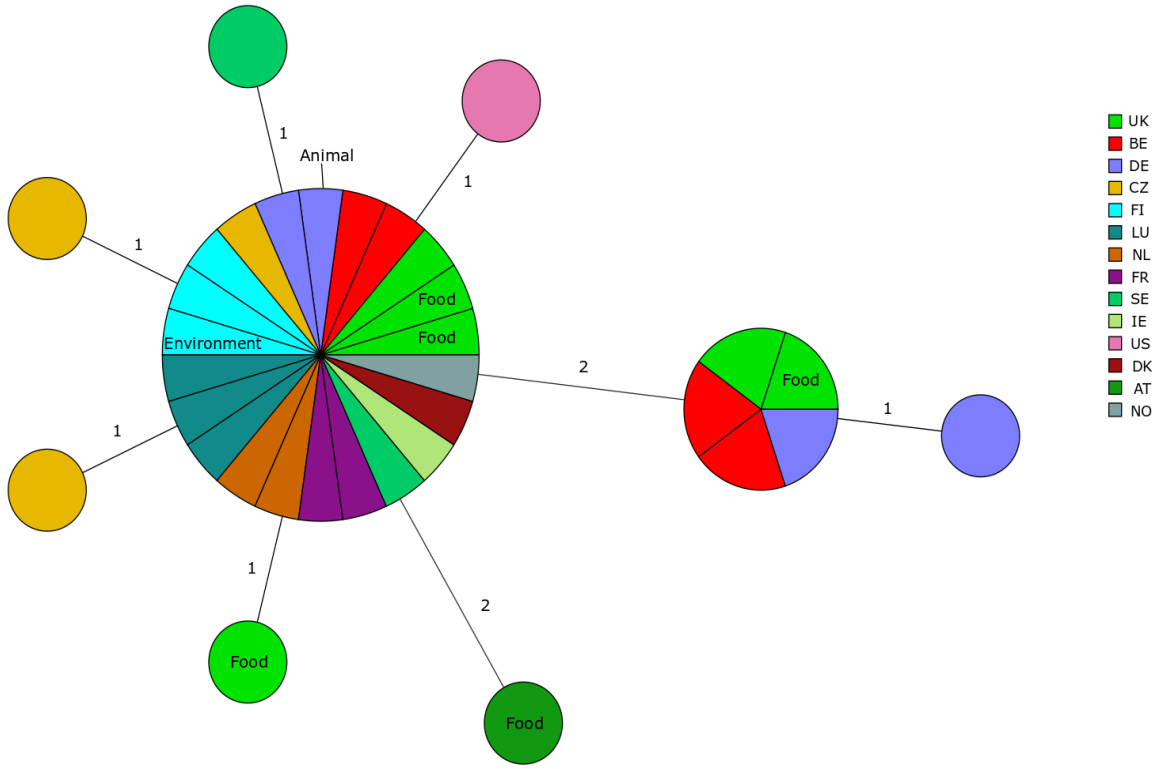
European whole genome sequencing analysis of human and non-human isolates

The EURL-*Salmonella* launched a consultation to Member States for submitting sequences of *S*. Braenderup isolated from food between June 2020 and June 2021. As of 6 July 2021, National Reference Laboratories (NRL) in thirteen EU countries replied: Austria, Belgium, Cyprus, Denmark, Estonia, Germany, Ireland, Italy, Latvia, Malta, Poland, Slovakia, Sweden. Austria replied by providing the sequence of the *Salmonella* Braenderup ST22 isolate matching the outbreak strain, identified in a pooled sample (peel sample from Galia, Cantaloupe, and honeydew melons). Cyprus reported two *S*. Braenderup isolates from dry mint and laying hens, collected in January and February 2021. WGS results were not yet available for the isolates from Cyprus. Ireland reported two *S*. Braenderup ST311 isolates from poultry process hygiene samples collected in 2020 and 2021, not related to this outbreak. Estonia reported one *S*. Braenderup isolate from a cattle carcass swab sampled in March 2021. WGS results were not available for the isolate from Estonia. Germany reported one *S*. Braenderup isolate from 2021 originating from the faeces of a spectacled bear at a zoo (composite sample), matching the outbreak reference sequence (ERR5863130) at 1 AD according to the national pipeline. All other EU countries that replied to the consultation reported no isolations of *S*. Braenderup from food during the selected time frame. The public health authority in the UK (Public Health England) also replied to the consultation by providing the accession numbers of four publicly-available *S*. Braenderup isolates from the two positive Galia melon samples: SRR14833788, SRR14832298, SRR14856466, SRR14857122.

Finland shared the sequence of the environmental sample (boot swab) collected on 17 May 2021 from a hobby hen-house via the EURL-*Salmonella.*

A minimum spanning tree (MST) of *S*. Braenderup ST22 isolates is presented in Figure 5. The MST, including human and non-human isolates (from food, animal and environment) shows a tight cluster of allelic profiles within 5 allelic distance.

Figure 5. Minimum spanning tree (cgMLST, EnteroBase scheme) including country representative outbreak sequences from 27 human *S*. Braenderup ST22 isolates from 14 countries, EU/EEA, the UK and the USA, 2021, five food isolates collected in the UK and Austria, one environmental isolate collected in Finland and one animal isolate collected in Germany in 2021



ECDC and EFSA risk assessment for the EU/EEA

Between 15 March and 6 July 2021, a rapidly evolving outbreak of 348 confirmed *S*. Braenderup sequence type 22 (ST22) infections was reported in 12 European Union/European Economic Area (EU/EEA) countries and the United Kingdom (UK). The cases were spread throughout the countries. There was a predominance of women over to men with a female-to-male ratio of 2.3. Only two cases reported travel, one to Sweden and one to Kosovo, and the majority of cases (99.1%) acquired the infection in their country. Hospitalisation was reported for 68 cases (39.8%) and there were no deaths reported.

The case interviews in the EU/EEA countries and an analytical epidemiological study in the UK suggested Galia melons as a possible vehicle of infection (OR 672 ($p<0.001$), followed by Cantaloupe melons with OR 77 ($p<0.001$).

S. Braenderup ST22 matching the representative outbreak strain was isolated in two Galia melons in the United Kingdom (sampling date 1 June 2021). The two Galia melons originated from the same Batch A (arrival date 19 May 2021) and had been imported from Site 1 of the Honduran Producer A. According to the RASFF information shared by the food safety authority in Honduras via INFOSAN, 12% of Batch A was distributed to the EU and European Free Trade Association (EFTA) countries, 60% to the UK, and 28% to the USA. Once the two isolates were identified in the UK, the Honduran Producer A warned its customers in the EU countries to perform a recall of any Galia melons from Batch A still present on the market on 11 June 2021. One *S*. Braenderup ST22 isolate matching the representative outbreak strain was detected in Finland from a boot swab sample in a hobby henhouse where hens had been fed with melon rinds by their owner, who also tested positive for the outbreak strain. Moreover, one additional matching isolate was identified in Austria from a pooled sample of melons (Galia, Cantaloupe, and honeydew melons). However, the traceback information on the melons reported to have been consumed by the henhouse owner in Finland and on the pooled melons tested in Austria was not available in RASFF. Therefore, it was not possible to trace back the melons to their primary producers.

Based on the food exposure information, the food safety authorities in the countries involved carried out a traceback analysis of the different types of melon reported to have been consumed by the cases. The majority of the melons (Galia, Charentais, honeydew, and Cantaloupe melons) were traced back to the Honduran Producer A. Further traceability details (e.g. batch numbers) were not always available. These melons and melons from Honduras were also sampled by the food safety authorities in Luxembourg, Finland and Ireland. All samples tested negative for *Salmonella*. Moreover, *Salmonella* was not identified during the 2021 production season (December 2020–April 2021) at the Honduran Producer A.

Based on the epidemiological, microbiological, and traceability investigation, the vehicles of infection are presumably melons imported from outside the EU/EEA and the UK. Galia melons from one batch (Batch A) imported from the Honduran producer are probably the vehicle of infection in at least the confirmed cases that occurred after the delivery of Batch A (harvested and packed on 21 April 2021) and reported having consumed Galia melons. Batch A arrived in the UK on 19 May 2021 but this batch could only explain 6/102 (5.9%) of the cases reported in the UK. The first cases in the UK and in the EU/EEA countries were sampled in March 2021, before the contaminated Batch A was harvested, indicating that contaminated food vehicles must have been circulating in these countries earlier. The isolation of the outbreak strain in a pooled melon sample, which included Galia melons, in Austria from products delivered in April 2021 indicates earlier circulation in the food chain.

Therefore, further investigation is needed to identify the exact point and contributing factors of contamination along the production chain, including transportation.

The Honduran Producer A finished the Galia melon harvest and packaging on 26 April 2021. No additional exports from Honduras are foreseen until the new season starts in December 2021. Therefore, contaminated Galia melons from this source should not reach or be available on the EU market anymore. These measures reduce the risk of new infections due to Galia melon consumption. Clinical samples of the two most recent cases were taken on 9 June 2021 but, taking into account reporting delays and the possible occurrence of secondary cases, it is likely that new cases linked to this outbreak may still be reported, albeit at a decreasing frequency.

Disease background

Disease characteristics

Background information about salmonellosis can be found in the disease fact sheets from ECDC, US CDC, and WHO [3-5].

Disease surveillance for *Salmonella* Braenderup infections in the EU/EEA and the United Kingdom

Salmonella Braenderup isolation in humans

Salmonella Braenderup is reported as part of salmonellosis surveillance in the EU/EEA. Notification of non-typhoidal salmonellosis is mandatory in most of the EU Member States, as well as in Iceland and Norway. In four Member States, reporting is voluntary (Belgium, France, Luxembourg and the Netherlands). Food poisoning is a notifiable disease under national legislation in all the countries of the UK apart from Scotland. Under this legislation, reporting of *Salmonella* spp. isolated from human samples in public health laboratories is also mandatory throughout the UK. The surveillance systems for salmonellosis have national coverage in all Member States except three (France, the Netherlands and Spain). The population coverage in 2019 was estimated to be 48% in France and 64% in the Netherlands.

From 2007 to 2019, 4 031 cases of *S.* Braenderup were reported to the European Surveillance System (TESSy) by 27 EU/EEA countries. The average number of cases per year was 309 (range 229-463). The UK accounted for 36.7% of all cases, followed by Germany with 14.6% and France with 11.3%. The number of reported cases has been stable except for peaks in years 2007, 2010, 2012 and 2016 (Table 4). In 2019, 300 cases were reported and during the period 2015−2019, *S.* Braenderup ranked 19th among reported serotypes.

There is a predominance of females for all years except in 2014, when the number of males slightly exceeded that of females (Table 5). Among domestically-acquired infections, the annual predominance of females is less common but still visible in 2015−2019 (Table 6). In 2019, the proportion of females in the age group 15-24 years was significantly higher than that of males ($p<0.01$) (Figure 6).

The median age for all cases with information available was 32 years (interquartile range IQR=18–51); 54.8% (n=2 166/3 953) were female, and 48.5% (n=447/921) of infections were acquired in the reporting country. Over the years, 36.7% of cases have been reported during the period August−October for 2007−2019. Among domestically-acquired infections, June was an additional month during which the number of cases was higher than in other months.

Further information can be found in ECDC's annual epidemiological report [6] and the online 'Surveillance atlas of infectious diseases' [7].

Table 4. Distribution of *S.* Braenderup cases by year, EU/EEA and the UK, 2007−2019, (n=4 031)

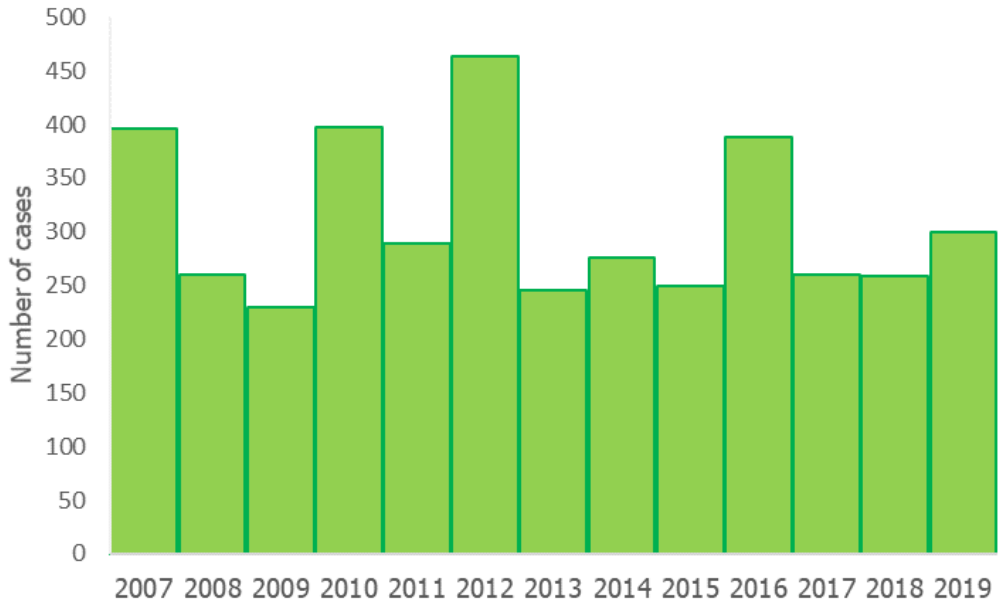


Table 5. Distribution of *S.* Braenderup cases by gender and year in the EU/EEA countries and the UK, 2007–2019 (n=3 953)

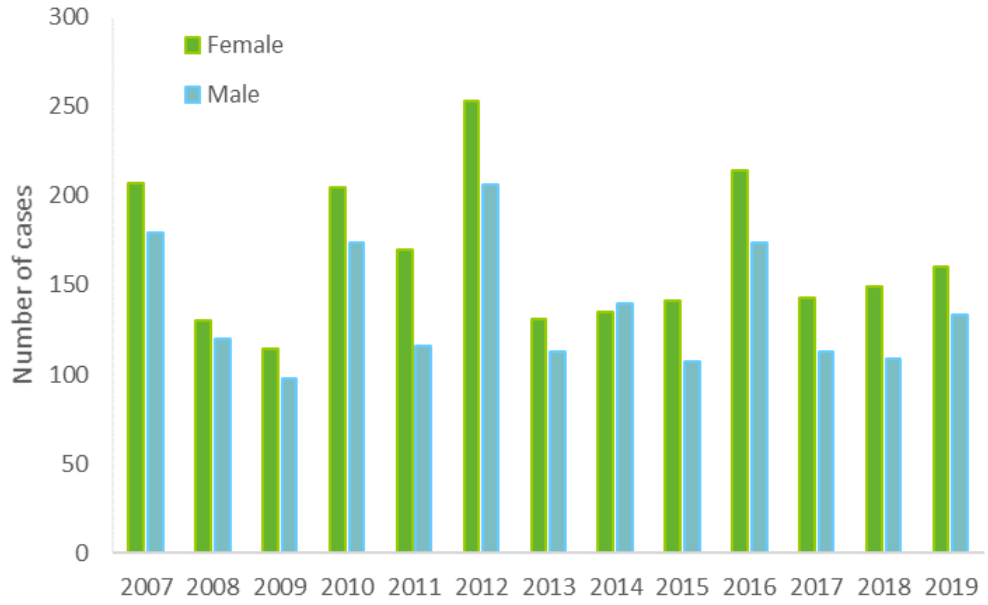


Table 6. Distribution of domestically acquired *S.* Braenderup infections by gender and year in the EU/EEA countries and the UK, 2007–2019 (n=1 207)

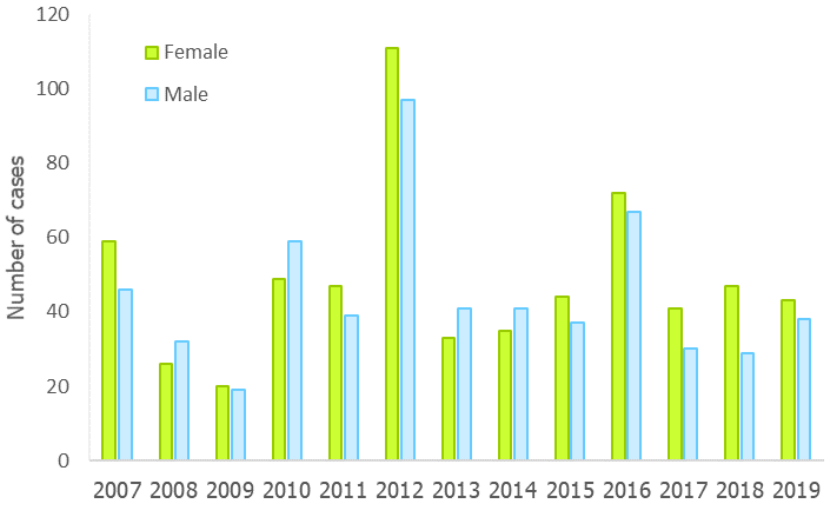
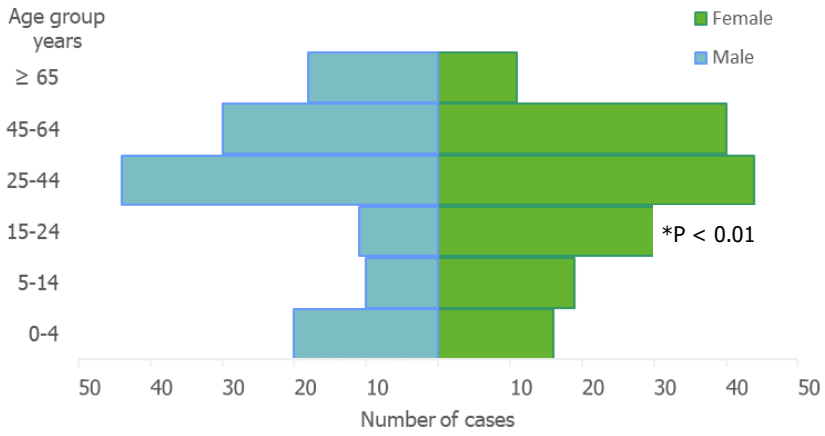


Figure 6. Distribution of *S.* Braenderup cases by age group and gender in the EU/EEA and the UK, 2019 (n=299)



Food-borne outbreaks caused by *S*. Braenderup

This section summarises country-specific data on food-borne outbreaks associated with *S*. Braenderup as reported to EFSA by the Member States in accordance with the Zoonoses Directive 2003/99/EC. From 2015 to 2019, three weak-evidence food-borne outbreaks caused by *S*. Braenderup were reported by Austria in 2016 (one outbreak) and by the United Kingdom in 2016 (two outbreaks). At the time of the data reporting, the United Kingdom was an EU Member State. The reported food vehicle was mixed food for one outbreak, and unknown for the remaining two outbreaks. In total, 68 human cases were reported (two cases in Austria and 66 in the United Kingdom). There were six hospitalised patients (one in Austria and five in the United Kingdom) and no deaths.

S. Braenderup isolation in food

In accordance with the Zoonoses Directive 2003/99/EC, for the years 2015–2019, 18 units positive for *S*. Braenderup were reported to EFSA for the matrix 'Food RTE and non-RTE' out of 9 511 total units tested by nine EU Member States (Belgium, Cyprus, Germany, Greece, Hungary, Ireland, Italy, the Netherlands, and Spain).

The four units that tested positive from the 1 206 total units tested (0.33%) for the matrix 'Food RTE' belonged to 'other processed food products and prepared dishes – pasta' (reported by Hungary in 2016), 'cheeses, made from unspecified milk or other animal milk' (reported by Italy in 2017), and 'spices and herbs - dried' (reported by the Netherlands in 2018).

The 14 units positive out of the 8 305 total units tested (0.17%) for the matrix 'Food non-RTE' belonged to the following matrices: 'frogs legs' (two units reported by Belgium in 2016 and 2018); 'meat from bovine animals – fresh' (one unit reported by Germany in 2017); 'meat from bovine animals – carcasses' (two units reported by Spain in 2019); 'meat from pig – carcasses' (one unit reported by Cyprus in 2015); 'meat from pig – carcasses' (one unit reported by Italy in 2019); 'meat from spent hens (*Gallus gallus*)' (one unit reported by Belgium in 2018); 'meat from broilers (*Gallus gallus*) – carcasses – spent hens' (one unit reported by the Netherlands in 2019); 'meat from broilers (*Gallus gallus*) – meat preparation – intended to be eaten cooked' (one unit reported by Greece in 2016); 'meat from broilers (*Gallus gallus*) – fresh' (one unit reported by Hungary in 2017); 'meat from broilers (*Gallus gallus*) – carcasses' (one unit reported by Ireland in 2019); 'molluscan shellfish – raw' (one unit reported by Italy in 2019); and 'live bivalve molluscs – mussels – depurated' (one unit reported by the Netherlands in 2019).

Options for response

ECDC encourages public health authorities to perform sequencing of isolates from domestically acquired *Salmonella* Braenderup infections and report any unusual increases in *Salmonella* infections in the European Surveillance Portal for infectious diseases (EpiPulse), as well as to cooperate closely with the food safety authorities on national and multi-country foodborne events. ECDC can offer sequencing support to facilitate epidemiological and microbiological investigation of EU/EEA-wide events.

EFSA encourages Member States to perform sequencing of *S.* Braenderup food isolates related to the RASFF notification 2021.2601 and/or linked to the present cluster either microbiologically (serogroup or ST) or epidemiologically (e.g. consumption of melons by human cases or isolates linked to the companies involved as in RASFF 2021.2601), and to share these sequences with EFSA and the EURL for *Salmonella*. Further information about food traceability investigation can be requested from the RASFF contact point for the relevant countries. EFSA can offer sequencing support to those countries who have no capacity (on request via roa-efsa@efsa.europa.eu). It is recommended that laboratories follow the advice of the EURL *Salmonella* on the best way to sample whole melons to test for *Salmonella*, as in the document entitled 'Sampling whole melons to check for the presence of Salmonella' (Request from EC DG-Sanco 09-10-2012) [8].

Source and date of request

On 11 June 2021, ECDC sent an official request to EFSA for the production of a joint Rapid Outbreak Assessment which EFSA accepted on the same day.

Consulted experts and national contact points

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All public health experts have submitted declarations of interest, and a review of these declarations did not reveal any conflict of interest.

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RASFF contact points in Honduras and the United Kingdom were consulted by SANTE RASFF.

National experts consulted by the RASFF contact points:

Czechia: Lenka Bartošová (Czech Agriculture and Food Inspection Authority).

Norway: Laila Jensvoll (Norwegian Food Safety Authority).

Ireland: Martine Brennan (The Food Safety Authority of Ireland).

Luxembourg: Patrick Hau, Commissariat du gouvernement à la qualité, à la fraude et à la sécurité alimentaire (Ministère de la Protection des consommateurs); Dr. Sc. Catherine Ragimbeau, Département de Microbiologie (Laboratoire National de Santé); Dr. Sc. Gilbert Moris, Département des laboratoires protection de la santé (Laboratoire National de Santé); Telma Velez, Division de l'inspection sanitaire (Ministère de la Santé); Dr. Joël Mossong, Direction de la Santé (Ministère de la Santé); Fabienne Clabots, Division de la Sécurité alimentaire (Ministère de la Santé); Ludovic Leyder, Division de la Sécurité alimentaire (Ministère de la Santé); Carole Goebel, Commissariat du gouvernement à la qualité, à la fraude et à la sécurité alimentaire (Ministère de la Protection des consommateurs).

Austria: Christian Kornschober (Austrian Agency for Health and Food Safety).

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Switzerland: Federal Food Safety and Veterinary Office, FSVO.

Belgium: Christiaens Anneline (Federal Agency for the Safety of the Food Chain), Laurence Debrassinne, Bavo Verhaegen (Sciensano).

Finland: Annika Pihlajasaari (Finnish Food Authority).

Disclaimer

ECDC issued this outbreak assessment document in accordance with Article 10 of Decision No 1082/13/EC and Article 7(1) of Regulation (EC) No 851/2004 establishing a European Centre for Disease Prevention and Control (ECDC), and with the contribution of EFSA in accordance with Article 31 of Regulation (EC) No 178/2002 of the European Parliament and of the Council of 28 January 2002, laying down the general principles and requirements of food law, establishing the European Food Safety Authority (EFSA) and laying down procedures in matters of food safety.

In the framework of ECDC's mandate, the specific purpose of an ECDC-EFSA outbreak assessment is to present different options on a certain matter. The responsibility on the choice of which option to pursue and which actions to take, including the adoption of mandatory rules or guidelines, lies exclusively with EU/EEA Member States. In its activities, ECDC strives to ensure its independence, high scientific quality, transparency and efficiency.

This report was written under the coordination of an internal response team at ECDC, with contributions from EFSA, at the behest of the European Commission based on a mandate requesting scientific assistance from EFSA in the investigation of multinational food-borne outbreaks (Ares (2013) 2576387, Mandate M-2013-0119, 7 July 2013).

All data published in this rapid outbreak assessment are correct to the best of ECDC's and EFSA's knowledge as of 20 July 2021. Maps and figures published do not represent a statement on the part of ECDC, EFSA or its partners on the legal or border status of the countries and territories shown.

References

1. Alikhan NF, Zhou Z, Sergeant MJ, Achtman M. A genomic overview of the population structure of *Salmonella*. PLoS Genet. 2018 Apr;14(4):e1007261.
2. Dallman T, Ashton P, Schafer U, Jironkin A, Painset A, Shaaban S, et al. SnapperDB: a database solution for routine sequencing analysis of bacterial isolates. Bioinformatics. 2018 Sep 1;34(17):3028-9.
3. European Centre for Disease Prevention and Control (ECDC). Facts about salmonellosis: ECDC; [cited 9 May 2021]. Available from: https://www.ecdc.europa.eu/en/infectious-diseases-and-public-health/salmonellosis/facts
4. US Centers for Disease Control and Prevention. Salmonella: CDC; [cited 9 May 2021]. Available from: https://www.cdc.gov/salmonella/general/technical.html
5. World Health Organization (WHO). Salmonella (non-typhoidal): WHO; [cited 9 May 2021]. Available from: https://www.who.int/news-room/fact-sheets/detail/salmonella-(non-typhoidal)
6. European Centre for Disease Prevention and Control (ECDC). Salmonellosis - Annual epidemiological report for 2017: ECDC; [cited 9 May 2021]. Available from: https://www.ecdc.europa.eu/en/publications-data/salmonellosis-annual-epidemiological-report-2017
7. European Centre for Disease Prevention and Control (ECDC). Surveillance Atlas of Infectious Diseases Stockholm: ECDC; 2020 [cited 9 May 2021]. Available from: https://atlas.ecdc.europa.eu/public/index.aspx
8. EURL Salmonella. Sampling whole melons to check for the presence of Salmonella: National Institute for Public Health and the Environment (RIVM); 2012 [cited 9 July 2021]. Available from: https://www.eurlsalmonella.eu/documenten/sampling-whole-melons-for-salmonella.

Annex 1

Table A1. Traceability of melons linked to food exposure information as provided by the food safety authority in Norway in RASFF 2021.2601 (*fup2*)

Batch/ Consignment	Type of products	Origin (country)	Wholesalers (country)	Suppliers	Sub-suppliers	Recipients (country)	Date of receipt
Batch C	Galia melon	Honduras	Norwegian Wholesaler J	Dutch Wholesaler L	Dutch Importer L	Nursing home (NO)	09.04.21
Batch C	Galia melon	Honduras	Norwegian Wholesaler J	Dutch Wholesaler L	Dutch Importer L	Restaurant (NO)	06.04.21
Batch C	Galia melon	Honduras	Norwegian Wholesaler J	Dutch Wholesaler L	Dutch Importer L	Restaurant (NO)	13.04.21
Galia melon Batch D	Galia melon	Costa Rica	Norwegian Wholesaler J	Dutch Wholesaler L	Costa Rican Wholesaler P	Restaurant (NO)	13.04.21; 16.04.21
Galia melon Batch E	Galia melon	Brasil	Norwegian Wholesaler J	Norwegian Wholesaler N	Dutch Wholesaler D	Nursing home (NO)	From 16.4 – 22.4.21
						Restaurant (NO)	16.04.21, possibly 23.04.21
Galia melon Batch F	Galia melon	Brasil	Norwegian Wholesaler J	Norwegian Wholesaler N	Dutch Wholesaler D	Restaurant (NO)	23.04.21
Piel De Sapo Batch G	Piel De Sapo melon	Costa Rica	Norwegian Wholesaler J	Dutch Wholesaler L	Costa Rican Wholesaler P	Nursing home (NO)	26.03.21; 09.04.21
Honeydew Batch H	Honeydew melon	Costa Rica	Norwegian Wholesaler J	Wholesaler O	Costa Rican Wholesaler Q	Nursing home (NO)	26.03.21

Table A2. Information on type of the sampled melons as provided by the food safety authority in Luxembourg in RASFF 2021.2601 (*fup15, fup39*)

Product	Brand	Company (Producer or Supplier)	Origin
Melon Cantaloupe	Brand A	Honduran Producer A	Honduras
Melon jaune	Brand B	Spanish Company L	Spain
Melon jaune	Brand C	Company M	Spain
Melon vert	Brand B	Spanish Company N	Spain
Melon Red Falcon	Brand E	Company O	Italy
Limelon (melon citron)	Brand F	Spanish Company P, packed by Dutch Company Y	Spain
Melon Galia	Brand G	Company Q	Spain
Melon Charentais vert	Brand H unknown	Company R	Morocco
Melon Charentais jaune	Brand I	Company S	Spain
Melon Charentais jaune	Brand J	French Company T	France
Melon Orange Cantaloup	Brand K	Italian Company U	Italy
Melon Galia	Brand L	Spanish Company V	Spain
Melon vert	Brand M	Spanish Company W	Spain
Melon Charentais	Brand N	Moroccan Company X	Morocco
Melon Charentais jaune	Brand O	French Company T	France
Melon jaune	Brand P	Spanish Company Z	Spain
Melon Amarillo	Brand Q	Spanish Company AA	Spain
Melon Bio Piel de Sapo	Brand R	Spanish Company AB	Spain
Melon Bio Galia	Brand S	French Company AC	Spain
Melon Bio Canari	Brand T	French Company AD	Spain
Melon Bio Charentais jaune	Brand U	French Company AE	France
Melon Charentais jaune	Brand V	French Company AF	Spain
Melon Charentais Jaune	Brand W	Spanish Company AG	Spain
Melon Charentais Jaune	Brand X	French Company AF	Spain
Melon Vert Piel Sapo	Brand D	Spanish Company AH	Spain
Melon Galia	Brand Y	Spanish Company AN	Spain
Melon Charentais Cantaloup	Brand Z	Spanish Company AN	Spain
Melon Piel de Sapo	Brand AA	Spanish Company AO	Spain
Melon Honey	Brand AB	Spanish Company AP	Spain
Melon Snowball	Brand AC	Spanish Company AQ	Spain
Melon Galia	Brand AD	Spanish Company AR	Spain
Melon Charentais	Brand AE	Luxembourgian Company AS	Spain
Melon Galia	Brand AF	Spanish Company AT	Spain
Melon Galia	Brand AG	Spanish Company AQ	Spain
Melon Piel de Sapo	Brand AG	Belgian Wholesaler G	Spain
Melon Charentais Jaune	Brand J	French Company T	Spain

Table A3. Traceability, type of melons distributed to the UK, and source of irrigation water information (as of 8 June 2021) provided by the food safety authority in Honduras in RASFF 2021.2601 (*fup30*)

Name of company	Variety of melon exported to UK	Importer in UK	Source of irrigation
Honduran Producer A Site 2	Galia	British Wholesaler A; British Importer C; British Importer D; British Importer E; British Importer F; British Importer G; British Importer H; British Importer I; British Importer J; British Importer K	1. Superficial sourced by Water Source D and drip irrigation is applied on the fields. 2. Harvest water from Water Source E is used for drip irrigation in the fields. 3. Ground water (wells) for drip irrigation is applied on the fields. 4. Ground water (wells) source the packing plant. Water is filtered and chlorinated, and samples are collected and analysed in the laboratory for *E. coli*, Total Coliforms, Fecal Coliforms, TBC, *Salmonella* spp. in the fields and packing plant.
Honduran Producer A Site 3	Cantaloupe, Yellow Honey Dew		1. Superficial water is sourced from Water Source F for drip irrigation in the fields. 2. Ground water (wells) for drip irrigation in the fields. 3. Ground water (wells) for use in packing plant. Water is filtered and chlorinated, and samples are collected and analysed in the laboratory for *E. coli*, Total Coliforms, Fecal Coliforms, TBC, *Salmonella* spp. in the fields and packing plant.
Honduran Producer A Site 1	Galia, White Honey Dew, Yellow Honey Dew		1. Superficial water is sourced from Water Source C for irrigation drip in the fields. 2. Ground water (wells) is used for irrigation water in the fields. 3. Ground water (wells) is used for packing plant. Water is filtered and chlorinated, and samples are collected and analysed in the laboratory for *E. coli*, Total Coliforms, Fecal Coliforms, TBC, *Salmonella* spp. in the fields and packing plant.
Honduran Producer B	Galia Harper	British Importer A; British Importer B	1. Superficial water sourced by the Water Source A and drip irrigation is applied on the fields. 2. Ground water (wells) used in the packing plant. Water is filtered and chlorinated, and samples are collected and analysed in the laboratory for *E. coli*, Total Coliforms, Fecal Coliforms, TBC, *Salmonella* spp. in the fields and packing plant.
Honduran Producer C	Cantaloupe	British Importer B	1. Superficial (harvest water) sourced by the Water Source B–and Water Source C. Drip irrigation is applied on the fields. 2. Ground water (wells) used in the packing plant. Water is filtered and chlorinated, and samples are collected and analysed in the laboratory for *E. coli*, Total Coliforms, Fecal Coliforms, TBC, *Salmonella* spp.in the fields and packing plant.